ISSN 0317-2473

Research Discussion Paper No. 60

MIGHT SUICIDE UNDERREPORTING AFFECT HYPOTHESIS TEST? THE CASE OF SUICIDE AND DIVORCE

By

Mark Speechley*

and

Frank Trovato**

*Department of Epidemiology and Public Health
Yale University School of Medicine

** Department of Sociology
University of Alberta

July 1989

90-06442/

ABSTRACT

To see if underreporting in the suicide rate might lead to erroneous conclusions, two upwardly-adjusted suicide rates were computed using Canadian provincial data from 1971 and 1978: one contained all identified suicides and all deaths of undetermined origin; the other contained these plus accidental poisonings and selected motor vehicle fatalities. No findings are substantively altered when these adjusted rates are regressed in separate analyses on divorce rates and several control variables, suggesting that the observed association between rates of suicide and divorce are not likely artifacts due to suicide underreporting.

KEYWORDS: Suicide, underreporting, vital statistics, divorce.

Introduction

While there is virtual consensus that true suicides are underreported in vital statistics, the issue whether the overall extent of underreporting is sufficient to mislead epidemiologic inquiry remains unsettled. One method of estimating the completeness of official returns consists of adding to the suicide rate deaths from other mortality categories that are themselves suspected of containing misclassified suicides,[1] *, **. The intent of this adjustment is not to replace the official rate but to create an upper estimate so that it can be seen by what margin suicide might be underrepresented in different groups, regions, or time periods. Key to the interpretation is whether epidemiologic features differ substantively between official and reformulated rates.

This reformulation approach has so far been employed more extensively in descriptive epidemiology than in analyses using statistical tests that require data of reasonable validity. Pescosolido and Mendelsohn[2] have recently reported that systematic misreporting of suicide exists across 404 U.S. county groups but probably not sufficiently to affect variables used to

---

* Sakinofsy, I., Roberts, R., Van Houten, A. The end of the journey: a study of suicide across Canada. Paper presented at the 8th International Congress on Suicide Prevention, Jerusalem, October, 1975.

** Speechley, M., Stavraky, K.M. Underreporting in Canadian suicide statistics. Paper presented at the 1st combined Meeting, American Association of Suicidology - International Association for Suicide Prevention, San Francisco, May, 1987.

test suicide theories. The purpose of the present study is to extend this approach by retesting an actual suicide hypothesis using two reformulated rates that presumably contain most missed suicides. The hypothesis to be tested concerns the positive association between rates of suicide and divorce that has recently been studied by Trovato[3] using Canadian data.

DATA AND METHODS

The independent variables used are identical to Trovato's[3] provincial (n=10) and territorial (n=2) data: CATHOLIC is percent Roman Catholic; EDUCATION is percent with completed university degrees; MARRIAGE is marriage rate; MIGRATION is rate of inmigration, and DIVORCE is probability of divorce among currently married.

The first reformulated rate is called SUD, the suicide rate plus the rate of undetermined death (ICD8 E980-E989). See[4] for complete code list. The undetermined death (UD) category was chosen because of empirical support from casewise reclassification studies suggesting that many UDs meet psychiatric, if not medicolegal, criteria for suicide.[5,6]

The second reformulated rate, SUDA, contains the same deaths as SUD plus all accidental poisonings (ICD8 Intermediate 'A' List AE140) and all deaths to drivers (ICD8 E816.0) and unspecified persons (E816.9) in non-collisions due to loss of control of a motor vehicle. The SUDA rate is thought to cast a deliberately wide net with respect to concealed suicides. Some

so-called accidental poisonings must truly be accidental in the sense that the decedent had not formed lethal intent (e.g. episodes of recreational drug use gone awry and 'cries-for-help' parasuicidal overdoses with sub-lethal intentions. Similarly, the most sophisticated investigations[7,8] have found a low prevalence of disguised suicides among motor vehicle accidents (MVAs), and automobile fatalities can readily occur due to intoxication, incompetence, fatigue, road factors or mechanical defect. Some car crashes, however, are probably suicides. Among MVA categories the 'non-collision' codes seem like the most likely repositories of disguised suicides as they are used when vehicles leave the roadway before hitting fixed objects or otherwise coming to a stop. Hence 'non-collision' refers merely to the absence of a collision in the roadway, not to the absence of impact.

The reformulated SUD and SUDA rates were used as dependent variables in separate multiple linear regression analyses. Otherwise the tests are identical (including the study years 1971 and 1978) to those performed by Trovato[3] using official suicide rates (hereafter 'S').

RESULTS

Table 1 lists the rates used as dependent variables in the analysis. It is clear that the difference between the suicide rate (S) and the suicide plus undetermined death rate (SUD) is smaller in almost all cases than the difference between SUD and the suicide, undetermined death and accident rate (SUDA).

TABLE 1: Mortality rates from suicide (S); suicide plus deaths of undetermined origin (SUD); and suicide, deaths of undetermined origin, and selected accidents (SUDA), by province/territory, Canada, 1971 and 1978.

YEAR/RATE

AREA	1971 S	1971 SUD	1971 SUDA	1978 S	1978 SUD	1978 SUDA
Nfld.	3.6	3.8	7.5	2.6	6.6	10.3
P.E.I.	11.6	11.6	19.7	13.1	14.7	26.9
N.S.	8.7	9.6	18.4	12.5	13.5	23.8
N.B.	6.9	9.7	17.6	13.0	15.2	25.1
Que.	9.2	11.5	17.4	14.2	21.2	24.7
Ontario	13.9	14.4	21.0	14.3	15.5	20.5
Manitoba	14.0	15.5	23.1	15.4	17.0	21.7
Sask.	8.4	9.8	17.3	17.3	19.4	27.7
Alta.	11.2	13.5	22.4	16.9	22.4	29.2
B.C.	17.4	18.0	31.8	18.3	22.4	32.8
Yukon	43.5	48.9	59.7	32.3	50.7	50.7
NWT	14.4	20.1	40.2	55.0	59.6	66.5
Canada	11.9	13.2	20.7	14.8	18.5	23.2

Source: Statistics Canada, Vital Statistics, Vol. 3: Deaths, 1971 and 1978.

Explanation of rates:

-S is the suicide rate per 100,000.

- SUD refers to rate per 100,000 of suicides plus deaths of undetermined origin.

- SUDA refers to the SUD rate (see above) plus accidental poisonings (ICD8) Intermediate 'A' list AE140) plus all deaths to drivers and unspecified persons in non-collisions due to loss of control (ICD8 E816.0 and E816.9). These rates are unstandardized (non-age adjusted) but no relationships are substantively altered if standardized or unstandardized rates are used (tables available from the authors on request).

The average size of the difference is apparent in the national rates. Because each year/jurisdiction rate is calculated with

the same denominators, they are additive; hence, the undetermined death component for any year/jurisdiction can be calculated by subtracting S from SUD, and the accident component by subtracting SUD from SUDA. When this is done with total Canadian rates, the size of the difference in 1971 is clearly greater between the SUDA and SUD rates. Specifically, the accident component contributes (20.7 - 13.2 =) 7.5 deaths per 100,000 on average, as against only 1.3 for the UD component. By 1978, however, the relative average size of the accident component has decreased to 4.7 per 100,000 while the undetermined death component has increased to 3.7. The epidemiologic importance of these comparisons is that, in relative terms, the potential for misclassification has increased in the undetermined death category and decreased in the accident category between 1971 and 1978.

Table 2 shows the regression analysis results.

TABLE 2: Multiple regression analysis of provincial suicide rates (S) and two adjusted suicide rates (SUD, SUDA), Canada 1971 and 1978.

	BETA			t			probability		
VARIABLE	S	SUD	SUDA	S	SUD	SUDA	S	SUD	SUDA
1971									
Divorce	.809	.857	.858	3.58	4.19	6.03	.01	.01	.01
Education	-.605	-.572	-.531	-2.86	-2.99	-3.99	.03	.02	.01
Marriage	.196	.107	-.094	1.05	0.64	-0.80	.34	.55	.46
Migration	-.227	-.239	-.220	-0.99	-1.15	-1.52	.36	.29	.18
Catholic	.045	.051	-.045	0.26	0.33	-0.41	.80	.76	.69
R^2 adjusted	.79	.80	.91						
F statistic	7.99	10.05	21.96						
(p value)	<0.25	<.01	<.001						

TABLE 2: Continued.

	BETA			t			probability		
VARIABLE	S	SUD	SUDA	S	SUD	SUDA	S	SUD	SUDA
1978									
Divorce	.671	.707	.734	3.13	3.72	3.71	.02	.01	.01
Education	-.443	-.614	-.541	-2.26	-3.18	-2.68	.06	.02	.04
Marriage	.577	-.320	-.385	-3.17	-1.98	-2.29	.02	.10	.06
Migration	-.043	-.074	-.110	-0.16	-0.30	-0.43	.88	.77	.68
Catholic	.289	-.199	-.224	-1.87	-1.45	-1.57	.11	.20	.17
R^2 adjusted	.784	.831	.816						
F statistic	8.994	11.790	10.752						
(p value)	<.01	<.005	<.01						

VARIABLE DEFINITIONS:

DIVORCE is the probability of divorce per 100.

EDUCATION is the percent of a province's population that has completed a university degree.

MARRIAGE is the marriage rate per 1,000 population.

MIGRATION refers to the interprovincial migration rate per 100.

CATHOLIC is the percentage of Roman Catholics.

SOURCES:

MIGRATION, EDUCATION, CATHOLIC: 1971 and 1976 Public Use Sample Tapes of the Canadian Census; also published census data for three provinces not included in P.U.S.T. - Prince Edward Island, Yukon and N.W.T; MARRIAGE: Statistics Canada, Vital Statistics, Vol. 2: Marriages and Divorces, 1971 and 1978; DIVORCE: computed from data made available by Statistics Canada.

For 1978, changes in statistical significance occur with two variables: EDUCATION, which significantly predicts only the reforumlated rates, and MARRIAGE, which significantly predicts only the unadjusted rate. The values of R^2 are higher for the

reformulated than for the unadjusted rates in both years, but these predictors explain a substantial portion of the variance of all six sets of rates and the overall F statistic remains significant for all models.

DISCUSSION

Subject to the usual caveats regarding cross-level bias in ecologic data,[9] the findings consistently suggest that Trovato's[3] original results concerning the relationship between the divorce rate and the official suicide rate are unlikely to be artifacts of suicide underreporting. This can be added to the growing body of evidence[10,11] which suggests that suicide statistics, while requiring caution in their use, are adequate both for descriptions of relative prevalence differences and for hypothesis testing.

The finding of higher values of R^2 in the reformulated rates is compatible with observed epidemiologic similarities among different classes of exogenous mortality[12,13] and may serve as a stimulus for investigators to continue the exploration of the relationships between mortality and aspects of social structure.

REFERENCES

1. Brown, J.H.: Reporting of suicide: Canadian statistics. Suicide 1975:21-8.
2. Pescosolido, B.A., Mendelsohn, R.: Social causation or social construction of suicide? An investigation into the social organization of official rates. Am Sociol Rev 1986; 51:80-101.
3. Trovato, F.: The relationship between marital dissolution and suicide: The Canadian case. J. Marriage Fam. 1986; 48:341-348.
4. International Classification of Diseases, Eighth Rev., Vol. 1- Adapted for use in the United States. PHS Pub. 1693, Washington: USGPO, 1967.
5. Ovenstone IMK: A psychiatric approach to the diagnosis of suicide and its effect upon the Edinburgh statistics. Br. J. Psychiatry 1973; 123:15-21.
6. Holding, T., Barraclough, B.M.: Undetermined deaths - suicide or accident. Br. J. Psychiatry 1978; 133:542-549.
7. Schmidt, C.W., Shaffer, J.W., Zlotowitz, H.I., Fisher, R.S.: Suicide by vehicular crash. Am J Psychiatry 1977; 134:175-178.
8. Huffine, C.L.: Equivocal single-auto traffic fatalities. Life-threatening behavior 1971; 1:83-95.
9. Morgenstern, H: Uses of ecologic analysis in epidemiologic research. Am J Public Health 1982; 72:1336-1344.

10. World Health Organization: Changing patterns in suicide behaviour. Report on a W.H.O. working group. EURO Reports and Studies No. 74. Copenhagen: W.H.O.

11. Sainsbury, P., Jenkins, J.S.: The accuracy of officially reported suicide statistics for purposes of epidemiologic research. J Epidemiol Community Health 1982; 36:43-48.

12. Holinger, P.C., Klemen, E.H.: Violent deaths in the United States, 1900-1975. Soc Sci Med 1982; 16:1929-1938.

13. Porterfield A: Traffic fatalities, suicide and homicide. Am Sociol Rev 1960; 25:897-901.